United States Department of Agriculture • Forest Service

Station Paper No. 78

Northeastern Forest Experiment Station

Upper Darby, Pennsylvania
Ralph W. Marquis, Director

1955

Adaptability Of

Sash Gangsaw Mills

To Northeastern Conditions

Fred C. Simmons

Specialist in Logging and Sawmilling
Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture

NORTHEASTERN SAWMILL OPERATORS have been eyeing the sash gangsaw mill with new interest in the past few years. This type of mill, which cuts a whole log or cant at one time by means of a number of straight saws set in a sash frame that moves up and down, was rather common in the Northeast around the turn of the century.

However, the "Yankee gangsaws" used in those days were all cant gangsaws; they were best adapted to sawing squared timbers or rectangular cants that had already been squared up on a circular or band sawmill. By the early 1930's, the Yankee gangsaw was no longer in use in New England.

There were a number of reasons for this eclipse of the sash gangsaw in the Northeast. These were big machines, adapted to sawing selected portions of big logs, in a big mill. As the average size of the logs supplied to North-

eastern mills become smaller and the stands being logged become more scattered, portable mills took the place of stationary installations. Also, lumber-grading rules became established after World War I, which put a premium on sawing the maximum amount of high-grade lumber from these smaller logs. Consequently sash gangsaws became less popular.

The new element that has brought about the recent interest in sash gangsaws is the development of machines of smaller size. These smaller gangsaws were first developed in Europe for sawing round logs, particularly in Germany and the Scandinavian countries; but now there are a number of manufacturers in the United States and Canada.

Since World War II, eleven sash gangsaw mills (all but two of them built in Germany) have been installed in the Northeastern States. A number of additional Northeastern lumbermen are considering the installation of this type of mill, and numerous questions concerning their adaptability to Northeastern conditions and practices have been received in recent years by the Northeastern Forest Experiment Station. The data in this report were compiled in answer to some of these questions.

Utility Of Sash Gang Mills

The sash gangsaw mill is a fairly expensive machine. In the sizes adapted to most Northeastern logs it costs between $20,000 and $50,000 plus installation. These mills generally require a permanent installation on a sturdy concrete foundation to overcome the inherent vibration of the up-and-down cutting motion. Despite its slow cutting speed (generally 10 to 30 linear feet per minute) the sash gangsaw is a productive machine on medium and large logs, because it makes so many cuts at one time. The smaller logs may be fed in at faster rates, but productivity with them is lower because of the fewer cuts made and the narrower material produced.

Some grade is necessarily sacrificed in cutting the ordinary range of logs, either hardwood or softwood, in a sash gang mill. In most species the higher grade material is concentrated in a ring around the log, just under the bark. When the log is sawed through-and-through, the good side-cuts are obtained from the two side faces; but the high-grade material on the top and bottom of the log comes off on boards with the lower grade heart material.

For an industry using its material in narrow widths,

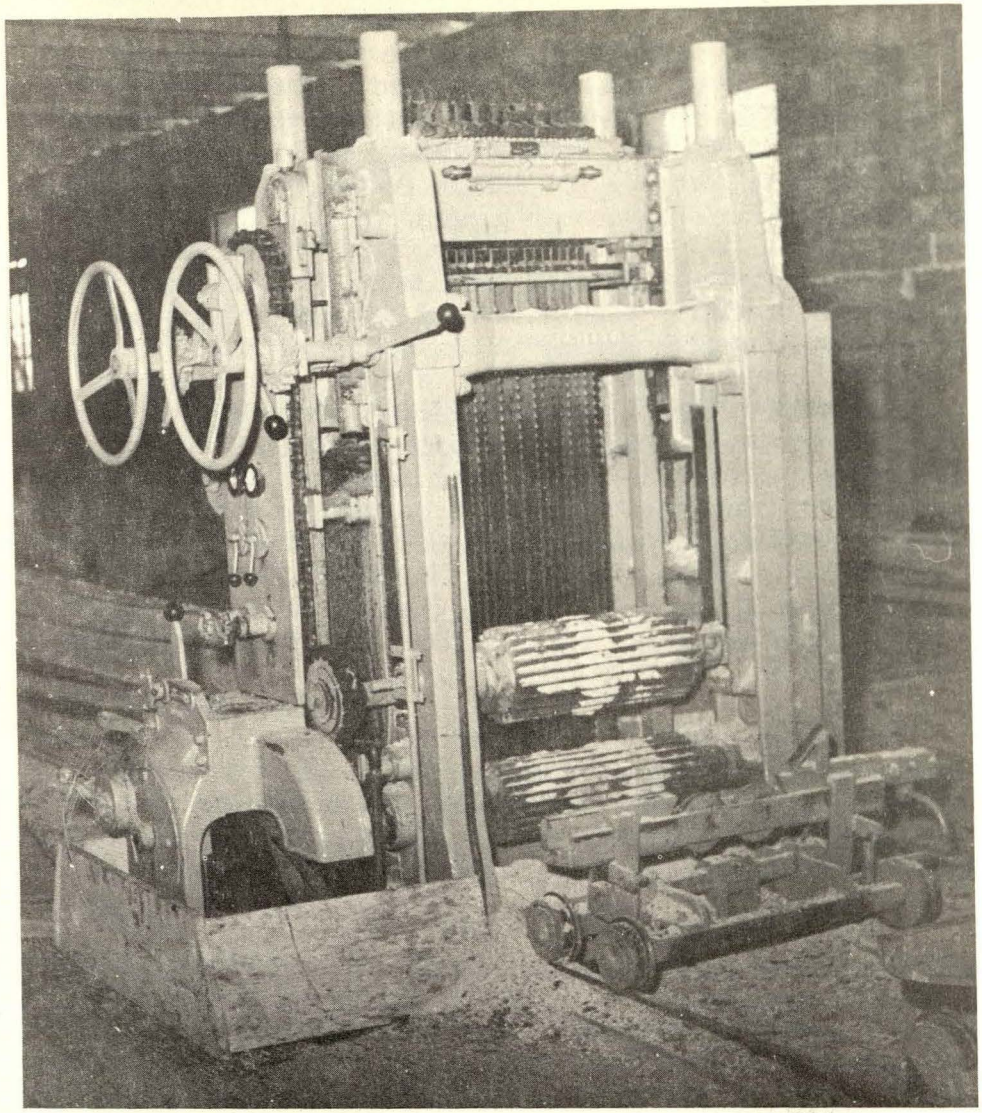

Figure 1.--A sash gangsaw. This German-built machine is in use at a sawmill at Coxsackie, N.Y.

such as a wood turnery, this is not too serious. But for one selling its product in the general market, where width and quality are the principal factors that influence price, it is very important.

Some European mills minimize this grade loss by sorting their logs by diameters, and running them through two sash gangs installed in tandem. In the first, the saws are set with a gap in the middle, corresponding to the average width of the low-grade heart wood. Before passing through

the second mill, which has saws set all the way across the frame, the log is given a 90-degree turn so that the good side-cuts are again obtained from this portion of the log. This practice is not feasible for the majority of Northeastern mills, which have a wider range of log diameters presented to them, and do not handle enough volume to justify the installation of two sash gangsaws.

Consequently the sash gangsaw is generally recommended for use primarily with uniformly low-grade logs, or with species where high-grade output is not important.

The sash gangsaw is inherently a machine that cuts very accurately. The saws are spaced at the intervals at which cuts are desired, are put under a heavy tension, and the material obtained is generally cut to exactly those sizes. Some Northeastern lumbermen, who formerly set their circular mills to cut 1-1/8 inch to allow for variations in sawing, have found that they can space their sash gangsaws at 15/16 inch and still turn out the same 3/4-inch material, dressed and dry.

However, this inherent accuracy is often upset when bumpy, crooked, and poor knotty logs are fed through the machine. The heaving and twisting that result from these irregularities cause inaccurate cutting at best. Sometimes they result in serious jams and machinery breakage.

Another objection sometimes voiced against use of the sash gangsaw is that it turns out so much round-edge material that a single edger and edger man cannot keep up with it. When a round log is sawed on a standard circular or band mill and is turned between cutting of the different grades, much of the material comes off the headrig square-edged, and it needs no further attention by the edger man.

Standard Mill And Sash Gang In Tandem

Most of these difficulties with the sash gangsaw are not insurmountable; they can be minimized by using a standard circular or bandmill ahead of the gangsaw, to slab off two opposite faces and perhaps obtain one or two high-grade side-cuts under the slabbed faces.

Then the remaining cant can be given a quarter turn, and put through the gang. Because the cant now has two flat faces, most of the feeding difficulties experienced with round logs are eliminated, and the gang will do the accurate cutting of which it is capable. Much of the product, of

course, comes out of the gang already square-edged, so the edger man has no more than his normal amount of work to do. Loss of productivity in sawing small logs can be minimized by stacking two or three cants on top of each other flat face to flat face and feeding them through the gangsaw together.

One of the selling points of the modern sash gangsaw mill is that the rear end of the log can be shifted laterally on its carriage as the log is being fed through the mill. In this way it is possible to saw around a gradual sweep in the log and produce boards with the same gradual curve in them, but which are straight-grained rather than cross-grained. These curved boards are straightened out in the drying process by stacking them under straight-grained material in the pile. Consequently, in the tandem setup recommended above, such sweepy logs should be slabbed with the "horns" either up or down on the standard sawmill carriage.

Necessity For Changing Saw Spacing

Many sawmill engineers still recommend that the logs received at a sash gangsaw mill be sorted by diameters, and that one size class be run through the mill at a time with one saw spacing; then the saws can be changed to a different spacing and another diameter class can be run.

Figures have been presented in advertising literature and in various publications to show that greater volume recoveries are obtained from large logs when 2-inch, 3-inch, and even thicker cuttings are made from their centers. These figures are based, however, on the common practice used in other regions when cutting softwoods: edging 1-inch lumber, as well as thicker material, to the next lower even-inch width--4-, 6-, 8-inch, etc. In the Northeast, 1-inch boards of softwoods such as spruce and white pine are commonly edged to odd-inch widths (5-, 7-, 9-inch, etc.) as well as even-inch widths. It is believed that this expensive sorting of logs might be less important in the Northeast than elsewhere.

The effect of this Northeastern edging practice on volumes recovered from logs of different sizes with different saw spacings was tested by scaling the width of boards and dimension stock obtainable from several saw spacings. This was done by diagramming the ends of logs of 6-inch to 20-inch diameters.

The results of this test are presented in table 1. This shows that the greater recovery obtainable from 1-inch lumber by edging to odd-inch widths as well as even-inch widths practically counterbalances the increased yield obtained by setting the saws for thicker cuttings on the larger logs. The test indicated that the Northeastern lumberman would obtain 6 percent greater yield when all saws are spaced at 1-inch intervals, for the range of diameters given in table 2, than his Southern or Western competitor.

Table 1.--Comparative output of sash gangsaw mills with different saw spacings, in board feet

(For 12-foot logs)

Saw spacing (in inches)	Log diameters, in inches														
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
All 1 inch	15	24	33	44	56	70	84	100	111	136	156	177	200	224	248
1-2, rest 1	14	23	33	44	57	71	86	103	114	140	161	183	206	231	257
2-2, rest 1	12	21	32	43	56	71	87	104	116	143	164	187	211	237	264
1-3, 2-2, rest 1	8	18	28	40	54	68	85	102	114	142	164	187	211	238	265
2-3, 2-2, rest 1	--	--	22	34	48	64	81	99	111	140	162	186	212	239	267
3-3, 2-2, rest 1	--	--	16	30	44	60	78	97	110	140	164	190	217	245	275

Note: Blocked figures indicate optimum.

Regression Equations

All 1 inch: $.641d^2 - 7.87$
1-2, rest 1: $.665d^2 - 9.4$
2-2, rest 1: $.690d^2 - 12.5$
1-3, 2-2, rest 1: $.705d^2 - 16.9$
2-3, 2-2, rest 1: $.730d^2 - 24.6$
3-3, 2-2, rest 1: $.770d^2 - 32.9$

Table 2.--Volumes obtained from optimum spacing as compared to good average spacing

Log diameter (inches)	Logs	Sash gangsaw mill				Circular mill (International ¼-inch kerf)	
		Optimum spacing		Spacing for two 2", rest 1"			
		Per log	Total	Per log	Total	Per log	Total
	No.	Bd.ft.	Bd.ft.	Bd.ft.	Bd.ft.	Bd.ft.	Bd.ft.
7	4	24	96	21	84	20	80
8	8	33	264	32	256	25	200
9	18	44	792	43	774	35	630
10	22	57	1,254	56	1,232	45	990
11	15	71	1,065	71	1,065	55	825
12	13	87	1,131	87	1,131	70	910
13	5	104	520	104	520	85	425
14	3	116	348	116	348	100	300
15	3	143	429	143	429	115	345
16	2	164	328	164	328	130	260
17	2	190	380	187	374	150	300
18	2	217	434	211	422	170	340
19	2	245	490	237	474	190	380
20	1	275	275	264	264	210	210
	100	--	7,806	--	7,701	--	6,195

In fact, with this representative distribution of log diameters (based on a spruce operation in Maine) only 1.3 percent more volume could be obtained by the optimum saw

spacing for each log-diameter class than from use of a good average saw spacing (two 2-inch cuts at the center, the rest of the log sawed into 1-inch material). This is shown in table 2.

The fact that higher prices can often be obtained for the thicker cuttings may still make it desirable to change the saw spacing for the large logs to recover the maximum possible yield of this thicker material.

Summary

The modern round-log sash gangsaw mills made in Europe and in this country offer attractive possibilities for use under current conditions in the Northeast, particularly for cutting low-grade softwood logs.

There are some difficulties in their use with round logs, including the heaving and twisting that occurs in sawing bumpy and crooked logs, low productivity with small logs, loss of high-grade wide cuttings on many logs, and a tremendous edging job when the product all has to be square-edged. But most of these difficulties can be eliminated when the sash gangsaw is used in tandem with a standard circular or band mill, and the logs are first slabbed on two opposite sides on the standard mill. Such a setup is recommended.

Sorting logs by diameter and running one diameter class at a time through the sash gangsaw, with a change of saw spacing for each class, is shown to be less important for volume recovery under Northeastern conditions than it is elsewhere. If thicker cuttings bring a materially higher price per board foot, it may still be desirable to sort out the larger logs and change the saw spacing to produce more of this class of material.

With these practices the sash gangsaw mill is believed to be well adapted for greater use in the Northeast, particularly for cutting the common run of low-grade softwood sawlogs, or in cutting hardwoods for structural purposes or for squares for the wood-turning industry.

AGRICULTURE-FOREST SERVICE-UPPER DARBY